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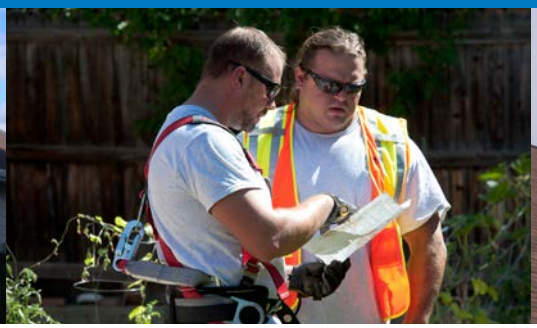


Solar Census—Perfecting the Art of Automated, Remote Solar Shading Assessments

Fast Facts

- The U.S. Department of Energy's (DOE's) *SunShot Initiative Incubator* program provides early-stage assistance to help startup companies cross technological barriers to commercialization while encouraging private-sector investment.
- As part of the Incubator program, Solar Census is leveraging its patented algorithms to produce a commercial-grade online shade tool, which they call Surveyor.
- Solar Census and the National Renewable Energy Laboratory (NREL) conducted a blind study to determine the accuracy of the remote shading algorithms used in Surveyor.
- A two one-sided test (TOST) was used to compare data collected in NREL's blind study. The Solar Census data and data from two Solmetric SunEye devices were found to be equivalent with a tolerance interval of ± 3.4 solar access values (SAVs).

Solar Census Surveyor is an online tool that performs remote shading analysis and creates a fully articulated three-dimensional (3-D) model of the site. Surveyor uses state-of-the-art software and patented algorithms to provide a solar access value (SAV) for every one-foot-by-one-foot section of the roof. The 3-D data, high-resolution imagery, and shade data are all preprocessed and stored in a database that can be instantly accessed by the solar community given the address of the property. Figure 1 is an example of a remotely generated 3-D image using Surveyor.

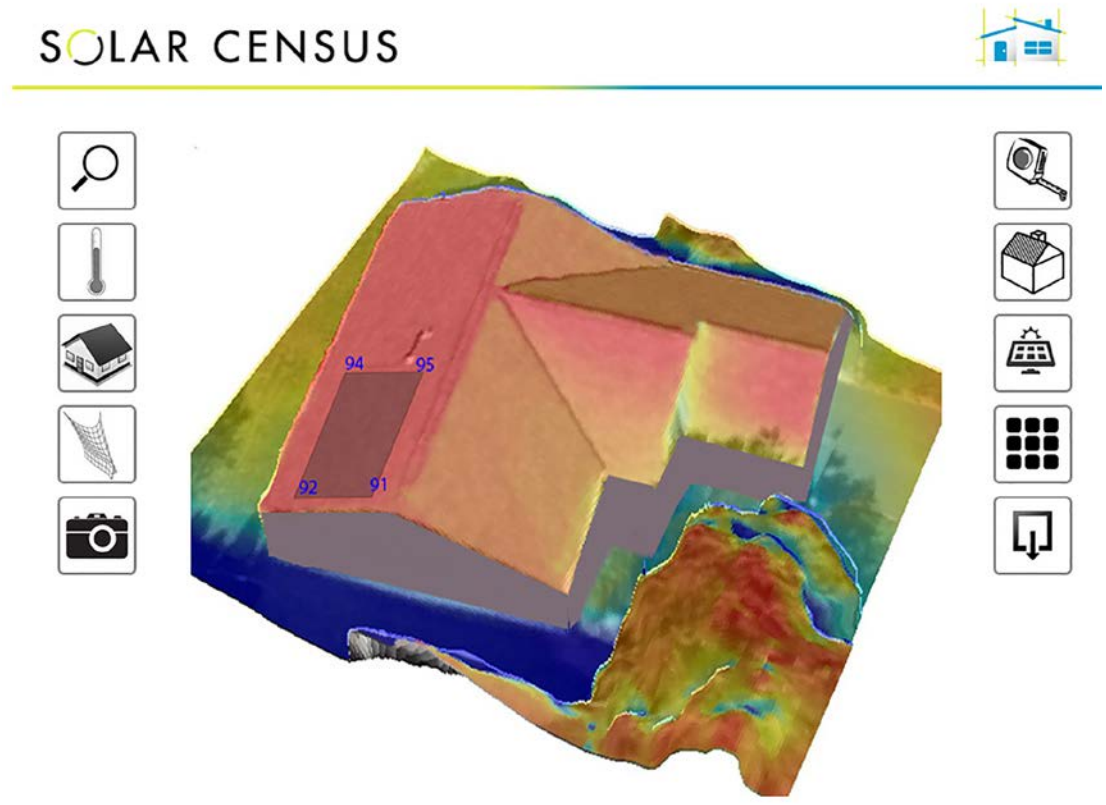

Figure 1. Remotely generated 3-D model of a residence and four SAVs using the Solar Census Surveyor online tool.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Accuracy of Remote Shading Projections

The National Renewable Energy Laboratory (NREL), in partnership with Solar Census and with support from the U.S. Department of Energy's (DOE's) SunShot Incubator program, conducted onsite assessments at four residential homes to determine the accuracy of Solar Census' remote shading algorithms. Measurements were taken at 43 points across four different homes in Northridge, California. The annual, summer, and winter SAVs that were remotely generated by Solar Census Surveyor were compared to the SAVs from two Solmetric SunEye devices. The shading of the four houses varied from heavily shaded to lightly shaded and included natural and manmade obstructions. For this blind study, NREL collected the SunEye SAVs. Independently (and remotely), Solar Census calculated SAVs using Surveyor for identical points on the roofs to those collected by NREL. These calculated SAVs were then provided to NREL for comparison to the collected measurements. A two one-sided test (TOST) was used to compare the Surveyor data with the readings from the SunEye devices.

The TOST method is a test of statistical equivalence. The method can be used to determine if two data sets are statistically equivalent (i.e., their differences fall within a given tolerance interval for a given confidence level). A tolerance interval of ± 5 SAVs was determined to be optimal. A confidence level of 95% was also used. Table 1 shows the results of the TOST method.

The Solar Census–SunEye Mean columns contain the mean difference between the Solar Census calculations and the SunEye measurements for the respective annual, summer, and winter data sets. Since the mean differences fall within the 95% confidence intervals (CI Upper and Lower Bound rows), and confidence intervals themselves fall within the tolerance interval of ± 5 SAVs, the Solar Census calculations are statistically equivalent to the SunEye measurements. Moreover, the two datasets are equivalent with a tolerance interval of ± 3.4 SAVs—an even tighter interval than was originally deemed optimal for the analysis.

Table 1. Two One-sided Test Results

	Solar Census—SunEye Mean		
	Annual	Summer	Winter
Mean	-1.698	-1.256	-1.767
CI Upper Bound	-0.691	-0.371	-0.661
CI Lower Bound	-2.705	-2.141	-2.874
Scientific equivalence @ ± 5 -->	Yes	Yes	Yes

Soft-Costs Savings Potential

Non-hardware (soft) costs have become a major driver of U.S. photovoltaic (PV) system prices, and aggressive soft-cost-reduction pathways must be developed to achieve the DOE SunShot Initiative's PV price targets.

Upfront or "sunken" customer acquisition costs can be addressed through software solutions that aim to streamline sales and system design aspects of customer acquisition. Software solutions that automate portions of the sales and system design process can reduce overall customer acquisition costs. Through a previous study, NREL has estimated the soft-cost reduction potential for solutions that address the sales and system design part of the process.

For software solutions including remote site assessment and improved bid-prep software, residential-system (5 kW) savings are estimated to be $0.17/W at scale.[1]

Although NREL has not independently certified the soft-cost savings of the Solar Census Surveyor product, the estimated savings of this type of tool deployed at market scale would be generally understood to impact soft costs to a similar degree. The automated computer-aided design (CAD) export capabilities of Surveyor will be investigated in an upcoming study. Additionally, there are likely several other applications for remotely and accurately generated SAVs that may have the potential to reduce soft costs in the area of consumer-targeting strategies.

[1] Non-Hardware ("Soft") Cost-Reduction Roadmap for Residential and Small Commercial Solar Photovoltaics, 2013–2020, http://www.nrel.gov/docs/fy13osti/59155.pdf

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